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IS 7703 (Part 2) : 1990
(Superseding IS 1228 : 1957)

(Reaffirmed 2002)

Indian Standard

METHODS OF TEST FOR MAN-MADE FIBRES CONTINUOUS FILAMENT FLAT YARN

PART 2 DRY AND WET TENACITY AND ELONGATION

(First Revision)

भारतीय मानक

कृत्रिम रेशा सतत तन्तु फ्लैट धागे की परीक्षण पद्धति

भाग 2 शुष्क और आर्द्र तन्यता तथा दीर्घीकरण

(पहला पुनरीक्षण)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

September 1990 **Price Group 2**

Physical Methods of Test Sectional Committee, TXD 1

FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards on 31 May 1990 after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

This standard, first published in 1975, is being revised to incorporate changes on the basis of experience gained during its use. In this revision the scope had been enlarged to cover continuous filament flat yarns of all man-made fibres including rayon and acetate instead of polyester and polyamide only. This standard supersedes IS 1228 : 1957 'Method for determination of dry and wet single strand strength and elongation of continuous filament rayon yarn and acetate yarn.

In the present revision due weightage has been given to the testing practices followed in the country in this field.

In the preparation of this standard assistance has been derived from the following publications:

Internationally agreed methods for testing viscose, cupro, acetate and triacetate Filament yarns. International Bureau for the Standardization of Man-Made Fibres (BISFA) Basle (Switzerland), 1984.

ASTM D 2256-88 Test method for tensile properties of yarn by single stand method, American Society for Testing and Materials. Philadelphia (USA).

This standard covering methods of test for man-made fibres continuous filament flat yarns is being issued in parts. This is part 2 of the series, other parts are:

Part 1 Linear density
Part 3 Commercial mass
Part 5 Unevenness percentage

In the present revision the following major changes have been carried out:

a) Method for determining elongation at predetermined load had been introduced.
b) For testing machine, curved type of clamps have been prescribed.
c) Provision for determination of wet tenacity and elongation has been included.

In reporting the results of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

METHODS OF TEST FOR MAN-MADE FIBRES CONTINUOUS FILAMENT FLAT YARN

PART 2 DRY AND WET TENACITY AND ELONGATION

(First Revision)

1 SCOPE

1.1 This standard (Part 2) prescribes methods for determination of dry and wet tenacity and elongation of man-made fibres continuous filament flat yarns.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
1070 : 1977	Water for general laboratory use (*second revision*)
1324 : 1966	Glossary of textile terms relating to man-made fibre and fabric industry (*first revision*)
6239 : 1971	General names for man-made fibres
6359 : 1971	Method of conditioning of textiles

3 PRINCIPLE

3.1 Conditioned specimen or the wet specimen is gripped between the two clamps of the tensile testing machine and a continual increasing load is applied longitudinally by moving one of the clamps until the specimen breaks. Values of elongation corresponding to a predetermined load, maximum breaking strength and elongation at break of the test specimen are noted. Tenacity is calculated by dividing the breaking strength in newton by the linear density in tex and multiplying by 100 and the elongation (percent) by dividing the elongation by the gauge length.

4 TERMINOLOGY

4.1 For the purpose of this standard, the definitions given in IS 1324 : 1966 and IS 6239 : 1971 shall apply.

5 SAMPLING

5.1 Sample shall be so drawn as to be representative of the lot.

5.2 Sample drawn in accordance with the procedure laid down in the material specification or as agreed to between the buyer and the seller shall be taken as representative of the lot.

6 ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING OF SPECIMENS

6.1 Unless otherwise agreed to between the buyer and the seller for testing of conditioned test Specimens, the test sample shall be conditioned to a moisture equilibrium from the dry side in the standard atmosphere (*see* IS 6359 : 1971) at 65 ± 2 percent relative humidity and 27 ± 2°C temperature for determination of dry tenacity and elongation.

NOTE — When a test sample under zero tension has been left in such a way as to expose, as far as possible all portions of it to the standard atmosphere for 24 hours, the test sample shall be deemed to have reached a state of moisture equilibrium.

6.2 The test shall be carried out in the standard atmosphere (*see* **6.1**)

6.3 For determination of wet tenacity and elongation the sample need not be conditioned in the standard atmosphere.

7 APPARATUS

7.1 Testing Machine

A single strand tensile strength testing machine working on one of the following principles shall be used:

a) Constant-rate-of-traverse (CRT)
b) Constant-rate-of-load (CRL), or
c) Constant-rate-of-extension (CRE)

The specimens shall break within 20 ± 3 seconds in case of constant-rate-of load and constant-rate-of-extension machines. In case of constant rate-of-traverse machine the rate of traverse shall be 300 ± 15 mm/minute, and the load range of the machine shall be such that the observed values would be between 10 and 90 percent of the full scale load. The permissible error in the machine at any point in this range shall not exceed ± 1 percent. The machines shall be provided with the following arrangements:

a) Two clamps to grip the specimen, each provided with following provisions:
   i) Each clamp of the machine shall be of curved type in which the yarn is gripped between the plain-faced jaws and this makes an half turn round a cylindrical extension of one of the jaws before passing on to the other similar clamp. The cylindrical friction surface shall be between 10 to 20 mm in diameter. An outline of the above type of clamp is shown in Fig. 1. The length of specimen between points A and A' is the test length.
   ii) Each clamps shall be provided with a mechanical or pneumatic device so constructed that through its means a specimen can be secured firmly between the jaws of the clamps so that it does not slip during the test. Also the edge of the surface of each jaw shall be such test it would not cut or damage the specimen during testing.

b) Means for adjusting the distance between the clamps.

c) Means for applying pre-tension of 0·5 ± 0·1 cN/tex to the specimen when clamped (tension device may be a dead weight, a spring or an air-acturated mechanism).

d) A scale and dial or autographic chart recorder graduated so as to give load and elongation at predetermined load and at break.

8 PROCEDURE

8.1 Test on Conditioned Specimens for Dry Tenacity and Elongation

8.1.1 Set the clamps of the testing machine so that the distance between the clamps is 250 ± 2 mm or 500 ± 2 mm or as agreed to between the buyer and the seller. With the help of preliminary specimens, set the machine so that the specimen breaks within 20 ± 2 seconds in the case of constant rate of loading or constant rate of extension type machine. In the case of constant-rate-of-traverse type machine, set the rate of traverse at 300 ± 15 mm/min. Take the yarn from the conditioned sample and discard a first few metres of yarn. Fix one end in the jaws of one clamp in such a way that the twist does not change. Apply the required pre-tension from the free end and secure it in the jaws of the other clamp.

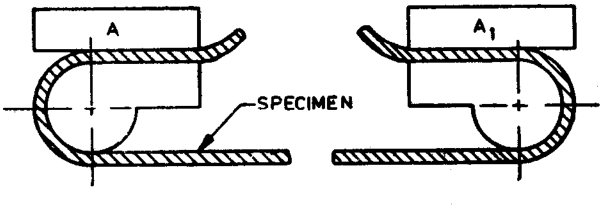

FIG. 1 SCHEMATIC DIAGRAM OF GRIPPING CLAMPS

8.1.2 Operate the machine and carry the test to rupture and record the breaking strength, elongation at predetermined load as required and elongation at break from the load elongation curve of the autographic chart recorder provided.

NOTE — Even if a test value is isolated on account of a break near the jaw, the value shall be noted but not taken into account in calculations. If such breaks exceed 10 percent of the number of specimens tested, suitable corrective action should be taken on the machine.

8.1.3 Open both the clamps and remove the broken specimen. Test another test specimen in a similar manner as in **8.1.2** discarding at random several metres of yarn between two successive tests. Perform minimum 10 tests or as agreed to between the buyer and the seller.

8.2 Test on Wet Specimens for Wet Tenacity and Elongation

8.2.1 Take the required number of test specimens either 20 or as agreed to between the buyer and the seller and immerse them in distilled water (*see* IS 1070 : 1977) for at least 2 minutes in case of regenerated cellulose rayon and 10 minutes for acetate rayon (*see* Notes 1 and 2).

NOTES

1 The period of immersion should be sufficient to wet out the specimens thoroughly. Longer periods of immersion would not register further loss of strength if wetting is sufficient. Specimens treated with water-repellent or water-resistant finishes may have to be immersed for prolonged period. For yarns which do not wet out readily with water, a penetrating agent such as neutral soap of a non-ionic wetting agent may be added to the water bath, the amount of the agent used being such as not to exceed that required to obtain maximum rate of wetting out and as not to affect the normal physical properties of the yarn.

2 If number of specimens cling together in the water bath, they should be separated by gently raising and lowering them in water so as to permit a single strand to be drawn out without strain.

8.2.2 Repeat the procedures laid down in **8.1.1** to **8.1.3** for all the specimens to be tested.

9 CALCULATIONS

9.1 Tenacity

Calculate the mean dry or wet breaking strength in newtons from all the observed values and calculate the tenacity as follows:

$$\text{Tenacity in cN/tex} = \frac{\text{Mean breaking strength in newton} \times 100}{\text{Mean linear density in tex}}$$

NOTE — The linear density of yarn shall be determined from the same package in accordance with Part 1 of this standard.

9.2 Elongation

Calculate the mean elongation at predetermined load as required and also at break in percent from all the observed values.

10 REPORT

10.1 The test report shall include the following;

a) Description of the material tested;

b) Type of the testing machine and its capacity;

c) Mean time for break or rate of traverse;

d) Specimen length;

e) Number of tests performed;

f) Mean dry or wet elongation at predetermined load, as required;

g) Mean dry or wet elongation at break; and

h) Mean dry or wet tenacity as required.

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